

July-August 1952

# METAL TREATING

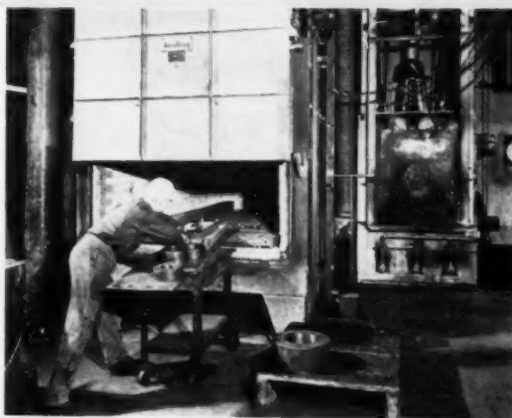


JOURNAL OF THE METAL TREATING INSTITUTE

*National Trade Association of*  
**COMMERCIAL HEAT TREATERS**



The plant of Fred Heinzelman & Sons, New York City, a member of MTI, often called the skyscraper heat treating plant. Complete heat treating facilities are laid out for efficient production on each story of this building.



Oil quenching rotor bodies from heavy-duty gas carburizing furnace into a recirculating oil quench bath.

Charging a Lindberg hot air recirculating furnace with work to be stress relieved.



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# THE Proven Practice FOR HARDENING TOOLS AND DIES

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**W**hen such an imposing array of the world's leading makers of high speed tools and dies adopt the same heat treating method and equipment, you can count on it that there's a reason—several reasons in fact.

**Productive capacity** is two or three times that of other heat treating methods because of faster heating.

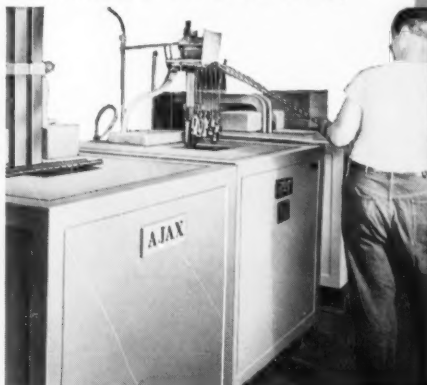
**Distortion** is negligible.

**Surface protection** is unsurpassed—because the salt bath seals the work automatically from all atmosphere. Scaling, decarb and pitting are avoided.

**Temperature control** is closer, more accurate. The temperature will not vary more than 5°F. in any part of the bath.

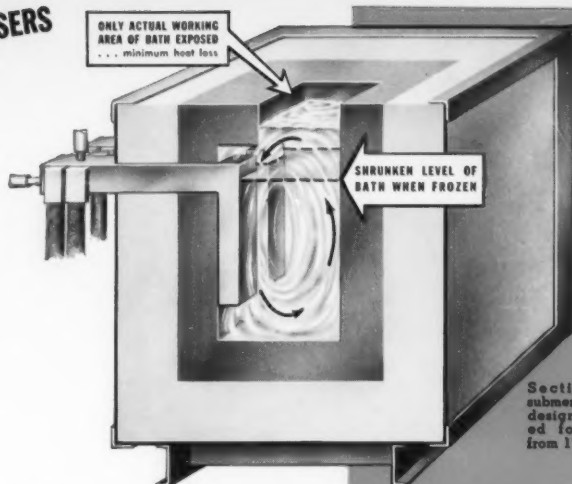
**The life of tools** is increased from 25% to 300% over those heated by ordinary methods.

**Adaptability**—The Ajax Salt Bath handles any type of high speed, carbon or



Typical installation for hardening high speed tools. Preheat, high heat and quench furnaces. The center unit operating at 2350°F. is equipped with submerged electrodes (see illustration at upper right). Preheat and quench units have suspended electrodes.

alloy tool and die steel. Moreover, it occupies less floor space, does not require a skilled operator and provides maximum protection and long life for pots.



Sectional view of submerged electrode design recommended for operations from 1700° to 2400°F.

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**Overheating of Work Eliminated**—Electrodes closely-spaced, set against back wall of furnace, prevent heating current from entering work. Entire bath depth available for work.

**Salt Leaks Prevented**—Complete outer steel casing.

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**ELECTRIC SALT BATH FURNACES**

# Editorial...

## WHAT ARE EXCESS PROFITS?

The roars and turmoils of two major political conventions may have recently distracted management's attention from the fact that Renegotiation activities are in full swing and that very shortly many companies will be called upon to argue and prove that operational profits are not excessive.

In a recent address before a meeting of the Radio-Television Manufacturers Association the Renegotiation Board chairman, John T. Koehler, set forth five "guide lines" which, according to the Board's interpretation of the statute, must be taken into account in establishing "what are excess profits". These are as follows:

1. Reasonableness of the contractor's costs and profits, with particular regard to production volume, normal earnings, and a comparison of war and peacetime profits.
2. Net worth, with particular regard to the amount and source of public and private capital employed.
3. The extent of risk assumed, including the risk incident to reasonable pricing policies.
4. The nature and extent of the contractor's contribution to the defense effort, including any inventive and developmental contribution and cooperation with the government and other contractors in supplying technical assistance.
5. The character of the contractor's business, the source and nature of the materials used, the complexity of the manufacturing technique, the kind and extent of his subcontracting, and the rate of turnover.

Of particular further interest is the attitude that the profit making history of the industry of which the contractor is a part will be taken into consideration during Renegotiation discussions. This was expressed during a discussion of additional reference points needed to answer the fundamental question. Although it is not clear just how any particular standard could be established the attitude does not express an open-mindedness and flexibility which, would be constructive particularly if it eliminates definitely the idea of establishing a fixed base period from which all determinations would be made.

The heat treating industry, divided as it is between several hundreds of commercial heat treating establishments and the many more industrial heat treating departments functioning as part of a product manufacturing activity, will probably prove as complex as any. In both cases, however, overall production efficiency, personnel skills and the proper application of modern scientific techniques will be important factors, as always, in the proper evaluation of an overall profit position. The industry in its various groups is showing steady progress along these lines and as a result should be establishing a solid and satisfactory profit history.

# METAL TREATING



Official Journal of the  
Metal Treating Institute

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## Zay Jeffries discusses Metallurgy of the Future

A noteworthy address was given by Dr. Zay Jeffries, retired vice-president, General Electric Company, and Past President, A.S.M., before a regional meeting of the American Society for Metals including representatives of Philadelphia, Northwestern Pennsylvania, Pittsburgh, York, Lehigh Valley and Penn State Chapters, at Pennsylvania State College on Friday June 20th.

Dr. Jeffries, who is considered by many the world's leading metallurgist today, was identified with the development of heat treatable aluminum alloys, cast and wrought; improvements in tungsten wire for lamp filaments; and improvements in tungsten carbide tools, generically known as cemented carbide. Each of these has greatly benefited our industrial life. He helped to organize, and presided over the World Metallurgical Congress held in Detroit, October 1951.

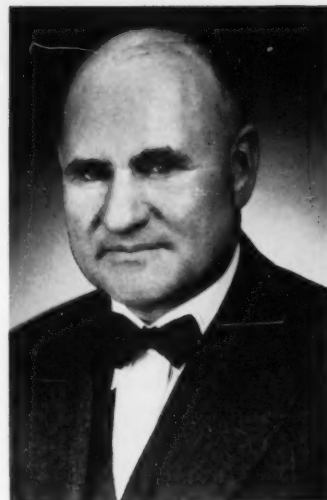
Probably the outstanding contribution to the advancement of physical metallurgy in modern times was the development of a consistent and rational explanation of the hardening of metals, known as the "Slip Interference Theory", introduced by Jeffries and Archer in their book "The Science of Metals". This presentation afforded the first clear insight into the phenomena of hardening of all metals, in all of the various ways. It simplified a great field of knowledge. There had previously existed a multitude of confusing and contradictory theories. It made possible great advances in the field of heat treating and lead to the development of many new heat-treatable alloys.

Dr. Jeffries' talk was of direct interest to all engaged in the heat treatment of metals because the future of metallurgy involves the future of heat treatment. Delivered entirely without reference to notes, it was a masterly analysis of complex problems affecting us all, and a memorable example of clear, logical philosophy presented in straight-forward terms. The following is a consciously inadequate attempt to report some of the highlights, in much abbreviated form, to the readers of METAL TREATING.

Dr. Jeffries pointed out that the future is, necessarily, built upon the present, and the present is a result of what has happened in the past. Evolution of the use of metals is coincident with the evolution of civilization. In 490 B.C. the Athenians, although greatly out-numbered, defeated the Persians because they possessed superior armor. The tide of battle has been turned many times in history by the use of superior metallurgy in arms and weapons. The development of nearly every modern industry rests upon the availability and the efficient use of metals. The nations which have these advantages take the lead.

Coincident with the advancement of metals and of civilization came a realization of the importance of the dignity of man and the freedom of his intellect. Out of this grew our Declaration of Independence, and the Bill of Rights in our Constitution. Such freedom gave man the opportunity to advance himself and from it developed free competitive enterprise, with its universal incentive toward progress.

Successful business, whether large or small, depends for survival upon rendering a satisfactory



Dr. Zay Jeffries

service and earning a profit. Competition is a necessary part of this set-up. It insures efficiency and creates an environment where only the efficient may endure. In our civilization there is necessarily competition for materials, for better production and for increased sales. Out of this complex system grew our present far-flung industries, great and small, and our superior standards of living.

Individuals of the present generation are no more capable than those of the past, witness—Leonardo da Vinci, Isaac Newton, William Shakespeare. We have no men of greater stature today. But the problems of our civilization have grown much faster than the inherent capacity of our individuals. Therefore, it is necessary to simplify. Science and education must be simplified. Generalizations must be drawn from many facts. There must be standardization without fixation. But we must beware of impractical theorists who, themselves having little personal capacity for success, yet wish to plan new ideologies for the rest of us. Popular among their nostrums is "more pay for less work" (meaning less output), and the regulation of our lives by an all-powerful, all-wise centralized government. If these schemes were carried to their logical conclusion we would all live in luxury, do no work whatever, and let all of our problems be solved by "the Great White Father"! What satisfaction would there be in such a life? There would be no opportunity to exercise our capacities. Life without a challenge to our abilities would be completely without interest. Exercise of the creative instinct in man is the one infallible source of lasting enjoyment.

It is a result of all these factors—freedom of the intellect, competition, and the exercise of creative instinct, that has given us our remarkable industrial civilization, and this has progressed with and depended upon the art and science of metallurgy. If we wish a future in metallurgy it is essential first to

*(Continued on page 19)*



# Hevi Duty Shaker Hearth Furnace

**EDITOR'S NOTE:** The series of articles on the Batch-Type furnace was completed with the May-June issue.

The interest aroused in a symposium of this nature covering a particular type of furnace leaves us to consider the desirability of another symposium, this time on continuous feed furnaces of various types, for example—Shaker hearth, moving belt, screw conveyor, roller hearth and the like.

We are herewith publishing an article on a small shaker hearth furnace which might be the forerunner of such a series.

Our readers are requested to indicate their interest in this program and to offer suggestions as to subjects which they would like to have covered editorially.

The need for furnace equipment capable of heat treating small parts to produce exact physical properties has existed for a long time. In the past, one popular method of heat treating small parts utilized a fabricated or cast container with a tight fitting cover. The container was usually filled with a mixture of parts and spent charcoal. This assembly was brought up to heat; then the parts and charcoal mixture were dumped into the quenching medium. This method taxed the knowledge and skill of the most experienced heat treater, and even then results were often erratic and rejections very high. The Hevi Duty Shaker Hearth Furnace was specifically designed to meet the demand of manufacturers who require exacting physical properties in small parts for items such as calculating machines, time measuring devices, locks, chain saws, etc. Special emphasis was placed on simple, rugged construction, easy maintenance and automatic operation.

## Construction

Figure 1 shows the shaker hearth furnace complete with quench tank and shaker mechanism. The horizontal heating chamber is surrounded by helical coils of 80% nickel, 20% chromium alloy which are supported in grooved refractory plates. The heating elements are arranged for zoned temperature control at temperatures to 1900° F. Graded, preformed insulation is enclosed in a round shell of sheet steel to provide minimum heat loss. In contrast with older rectangular shapes this design provides additional insulation on the two sides, top and bottom where most heat radiation loss occurs. The surface area of the round shell is at a minimum which further reduces radiation losses. The horizontal tube furnace is made in two halves to facilitate inspection and repairs.

A hearth plate extends into the retort to a point

directly over the quench chute which is integral with the retort and extends into the quenching medium, forming a gas tight seal. Connections are provided in the quench chute for the admission of a controlled atmosphere and for recirculating the quenching medium. A heat resistant glass window is built into the rear wall of the retort so that the work on the hearth plate can be observed. By periodic forward move-



Figure 1—Open view of Hevi Duty Shaker Hearth Furnace showing section through retort.

ments and abrupt stopping of the hearth plate, the parts being treated are gently moved through the heating chamber. An easily adjusted variable speed drive controls the rate of travel. The parts drop directly from the end of hearth plate into the quenching medium. Perforated steel receiving baskets or a conveyor are used to remove the parts from the quenching medium. (Figure 2.)

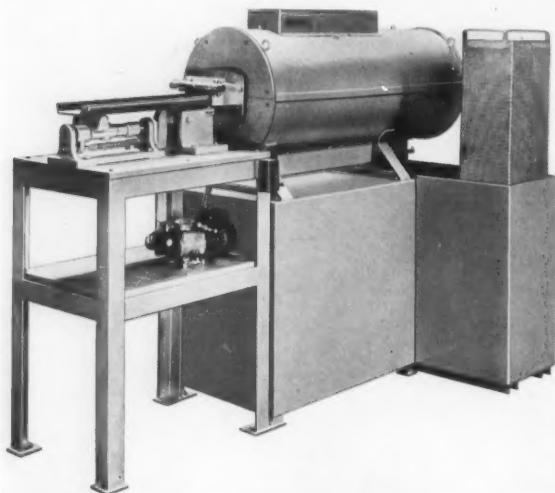
## Identical Treatment For Each Piece

One of the problems in heat treating small parts was the difficulty of giving each part the same treatment. Parts often chilled before they were quenched, and usually some parts were held at temperature longer than others resulting in distortion and non-uniform hardening. In the Hevi Duty Shaker Hearth Furnace, each piece is in the heated zone the same length of time and reaches the same temperature before quenching. The hardness or case depth of each piece in the same batch or subsequent batches, which are run under the same conditions, are uniform and at a predetermined level. By using a Hevi Duty Shaker Hearth Furnace in place of the container with spent charcoal, one firm reduced produc-

tion time from 16 hours to 75 minutes and eliminated rejects.

#### **Shallow Case Depths**

One of the most recent developments in product design is the use of parts with uniform case depth as shallow as .001". Experiments and production runs



**Figure 2—Hevi Duty Shaker Hearth Furnace, Type M-0534-S showing quench tank and basket.**

in the shaker hearth furnace have shown that shallow cases from .001" to .003" can be obtained in one to five minutes at heat. Variations of time in the heated zone of as little as one minute may vary case depth as much as .001". The ability of the Hevi Duty Shaker Hearth to accurately control time in the heated zone and to treat the entire surface of each part identically, in many instances has made possible the reduction of case depth specifications from .010" to .003".

#### **Surface Condition of Treated Parts**

The shaker hearth furnace was designed with atmosphere inlets arranged so that work is always protected by a prepared atmosphere. In many cases work comes out of the quenching medium as bright or brighter than before heat treatment. Where small parts are to be plated after heat treatment, pickling operations can usually be eliminated.

#### **Distortion**

The work is not pushed or mechanically handled in any way to deform it. Delicate parts with complicated shapes can be easily heat treated without warping or distortion. As an example, a manufacturer of calculating machines had been forced to punch certain clip parts from hardened steel strip which resulted in very short die life. Attempts to use annealed strip with subsequent hardening proved unsuccessful

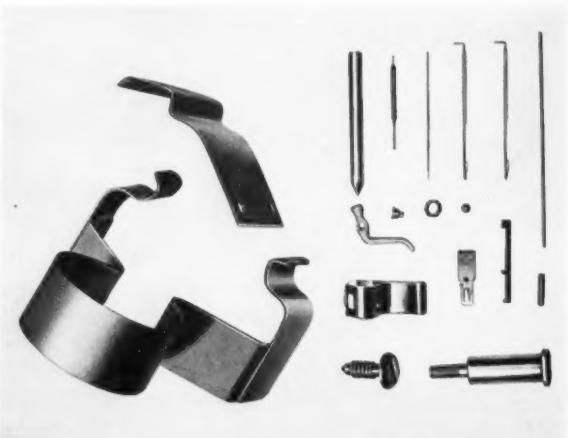
until the parts were treated in a Hevi Duty Shaker Hearth Furnace. In another instance it was impossible to form the required parts from hardened steel and an elaborate time consuming method of stacking parts on a tray was employed. Even with this painstaking method, rejections ran as high as 85% until the shaker hearth furnace was put into operation.

#### **Quenching System**

Work drops directly from the hearth plate in the hot furnace into the quenching medium. The parts are not handled or exposed to the air. The use of two receiving baskets permits segregation of small lots and also provides for continuous heat treatment of large production runs. A minimum amount of quenching medium is required since individual, or at most a few parts, are quenched at one time.

#### **Operation**

Operation of the furnace is simple and requires less skilled supervision. After the furnace is up to temperature and the variable speed drive is adjusted, the operator simply places the parts on the hearth plate or in a hopper and later removes them from the quench tank. The parts which are being heat treated are net work; since no trays or fixtures are needed, thus reducing power consumption and heating time. The simplicity of operation and elimination of trays, belts, or fixtures makes this furnace suitable for production line installation. It can be used for bright hardening, dry cyaniding, and carburizing. While the furnace was designed to heat treat small parts, production experience has shown that it can be used for



**Figure 3—Typical parts heat treated in a Hevi Duty Shaker Hearth Furnace.**

quality heat treatment of larger pieces. (Figure 3.) This is important to firms whose production requirements for small parts is not sufficient to warrant the purchase of a furnace for this work alone. Modified types of this furnace have been made for special applications.

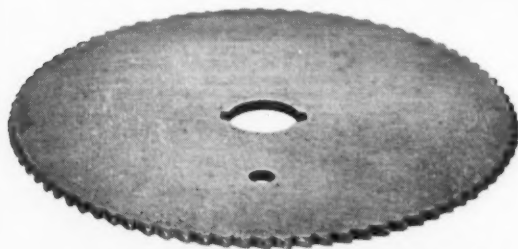
# A. B. Dick Company gets improved heat treating ...uses AEROCARB® E&W Carburizing Compounds

## on A. B. Dick 445 mimeograph parts

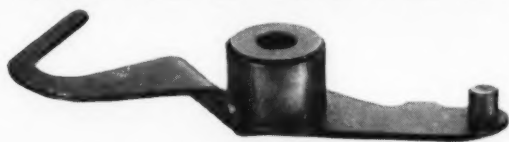
### THE MACHINE

*...its accuracy and stamina depend  
on good engineering, right down  
to each part and its heat treatment.*

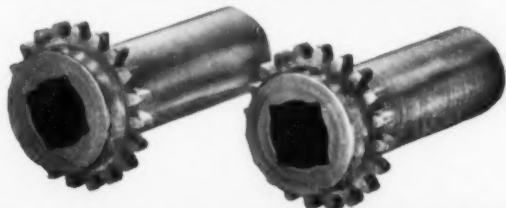
### THE PARTS



**Ratchet** made of SAE 1010 steel. Carburized with AEROCARB E&W at 1640° F, then oil quenched. Case depth .003-.005", Rockwell 15N 70-85. Must be flat to .025".



**Bearing Hub, SAE 1113, and Lever Bar SAE 1010**, copper brazed, then carburized in AEROCARB E&W, and oil quenched. Case depth .005", Rockwell 15N 85. Inside diameter of hub reamed before carburizing to .005" of size . . . no dimensional change in heat treatment.



**Drive Sprockets** — These two pieces are SAE 1113 steel, copper brazed, carburized in AEROCARB E&W at 1640° F, and oil quenched. Case depth .004", Rockwell 15N 85.



### ADVANTAGES


1. Copper brazed parts can be run without bath contamination . . . copper is not removed or leached out.
2. Excellent uniformity and hardness obtained for parts which have to work in contact or against each other.
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## "Insurance for Heat Treaters"

*Abstract of address delivered by Mr. Charles T. Easterby on the Special Insurance Policy arranged for the M.T.I. by him through London Lloyds, at M.T.I. Spring meeting at Lake Placid, New York on May 22, 1952.*

Officers and Members of the Metal Treating Institute, gentlemen: It is a pleasure to be invited to speak to you about the special insurance policy which has been developed for your members in London Lloyds.

I presume all of you are familiar with the policy and the events leading up to it. As you know, a committee headed by Mr. Horace C. Knerr, President of the Metlab Co., Philadelphia, had tried for several years to secure a policy available to all members of the Institute and to be exclusively available to your members, which would adequately protect the Metal Treater for claims brought against him as the result of damaging metals being treated for customers.

The committee worked hard. They were turned down by many Companies because, as you can verify from your own standard comprehensive public liability policy, this insurance excludes any damage to property of others in charge of the assured.

Early in 1951, Mr. Tiel Smith and Mr. Rex Bulley, who had been in conference with Mr. Knerr, approached me and asked me if I could work out a proposition. They had made several attempts with American Companies and been turned down, being told that this type of policy would put a premium on negligence and was something which had never been written.

After considerable correspondence with Lloyds, it was felt desirable to have one of Lloyds men from London see first-hand the operation of an American Commercial Heat Treating plant. Therefore, on the occasion of the next visit to the United States of a man from Lloyds, arrangements were made for a visit to the Metlab Company's plant. The risks of Metal Treating and how they could be covered by insurance were thoroughly discussed.

Following this gentleman's return to London, the matter was taken up with the underwriters who in turn, raised many questions. After considerable additional correspondence we secured the approval of a group of underwriters to entertain this proposition.

All this preliminary work was designed to produce a policy tailor-made for the Commercial Heat Treating Industry.

The wording of the contract was submitted to us and in turn to Mr. Knerr and we finally agreed on the all-embracing insuring clause which I quote:

"Underwriters agree to indemnify the assured to the extent provided herein and subject to the terms and conditions hereof against liability and costs in respect of any claim or claims which may be made against the assured during the subsistence of this policy by reason of the liability imposed upon the assured by law for loss and/or damage resulting

from any negligent act, error or omission and/or faulty workmanship, whenever or wherever committed in the handling or processing of metals in the course of their business as heat treaters."

Surely this phraseology clearly states exactly what is covered.

Our next question was to arrive at a rate basis. We were advised that the value of the products treated was, on the average, approximately ten times the charge for heat treating. The claims would be based on value of articles or materials damaged. However, since the value of the metal treated was not always known to the Heat Treating, we could not very well base a premium on valuation.

The only logical basis, therefore, seemed to be on the gross income of the Heat Treater. Arriving at this point, we had to get a rate which would be low enough for the Heat Treater to pay, based upon the known past experience and yet high enough to interest an underwriter.

We finally arrived at a rate of 1% of the gross receipts for which underwriters agreed to assume liability up to \$25,000.00 for any one lot, job or contract.

Insurance companies do not like to be presented with small claims arising out of normal operations which would ordinarily be charged off, and we agreed to start with a deductible for each loss of \$200.00. It was felt also that this would serve to discourage carelessness on the part of the Heat Treating.

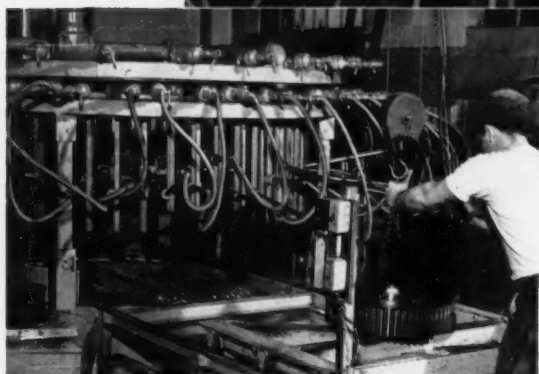
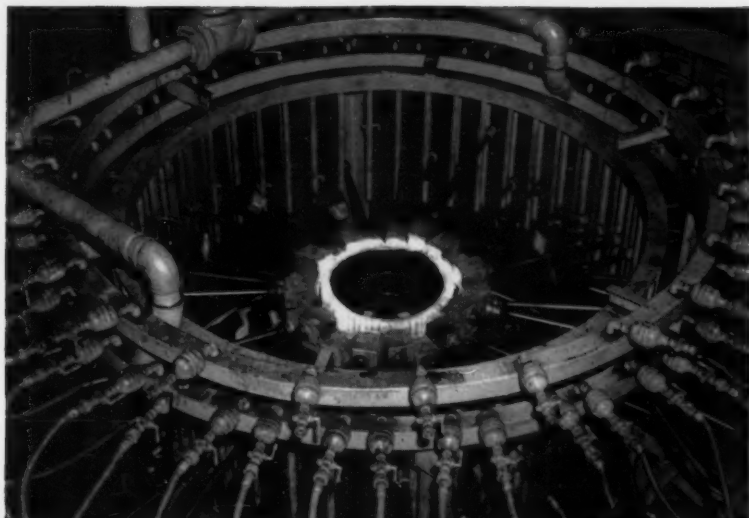
When all facts were thus ironed out, your Committee felt that the contract and rate are fair and acceptable as a starting basis.

Inasmuch as the whole matter has to go through an experimental stage, we arrived at an understanding with the underwriters that they would revise their rates in subsequent years based upon the actual developed experience, which of course presupposes a reasonable number of the Members of the Institute joining in the Plan.

Feeling that no actual solicitation should be made until proper publicity had been given to the Plan, Mr. Knerr, on behalf of his Committee, sent a letter to the Members on August 2, 1951. Following this, the September-October issue of your Magazine carried a two-page article. The Plan was also outlined at the Annual meeting in October, 1951 so that prior to this meeting all of you should have a good idea of the coverage. I am here not to deliver a formal talk to you but to engage in a discussion with you which I hope will be interesting and during which you may ask any question you desire and I will try to answer.

*(Continued on page 15)*





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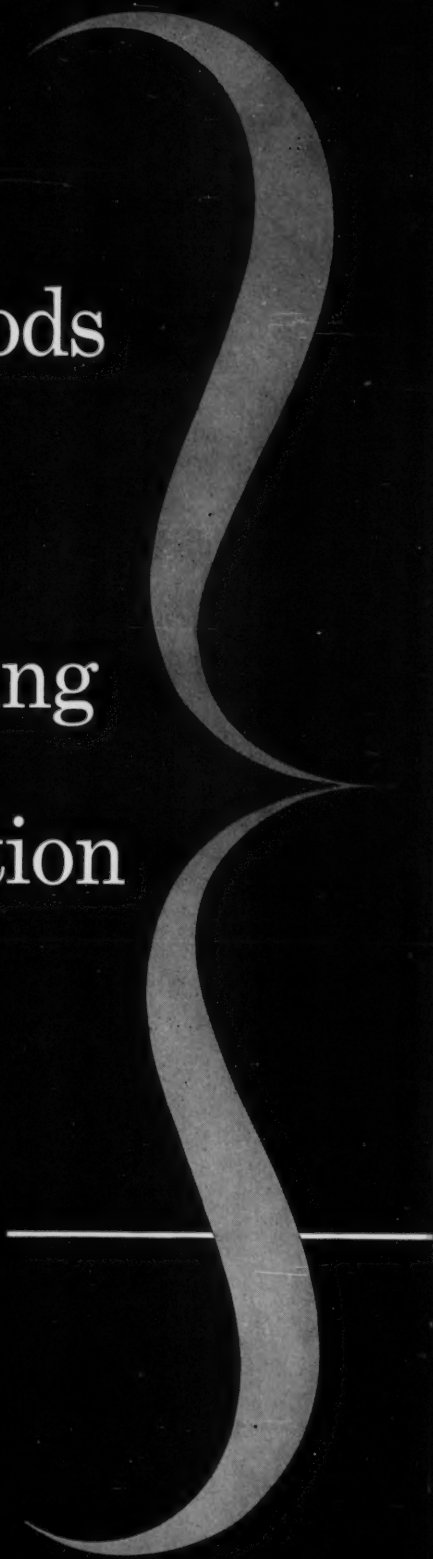
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*Devoted to the Materials Problems  
of Product Design and Manufacture*

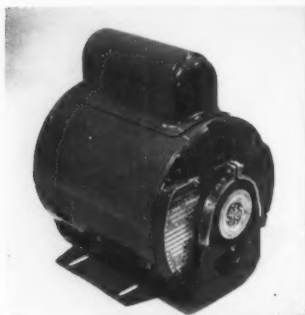


# News to Heat Treaters...

## Octagon Process To Reply To American Chemical Paint Company Suit

Octagon Process Inc., 15 Bank Street, Staten Island 1, N. Y., has announced its firm intention to contest the suit for alleged patent infringement filed on May 1, 1952 by the American Chemical Paint Company in the U. S. District Court for the Eastern District of New York. According to Octagon, the alleged infringement is concerned with the use of nickel as an accelerator in phosphatizing treatments on zinc surfaces. Octagon spokesmen state that the use of nickel accelerators in phosphatizing treatments was patented many years ago, and that these specific patents relating to the use of nickel accelerators expired long ago.

\* \* \*



## New Line FHP Motors

A new line of fractional horsepower motors embodying an entirely new concept of motor design and manufacture has been announced by the General Electric Company's Fractional Horsepower Motor Department. Less weight

per horsepower is claimed, among other advantages.

The motors are available in open dripproof and totally enclosed fan-cooled models in Types K (polyphase), KC (capacitor start), KH (split phase), and KCP (permanent split capacitor). These have hundreds of applications—on pumps, fans, blowers, compressors, office appliances, motorized tools of all sorts, etc. The design principles ultimately will be adapted to motors for more specialized uses as the Form G line expands.

\* \* \*

## New Department of Metallurgy

San Antonio, Texas, June 16.—Increased demand for industrial scientific research in the field of metallurgy has brought about the establishment of a department of metallurgy at Southwest Research Institute, Dr. Harold Vagtborg, president, has announced.

Appointed to head the department is Dr. Robert J. Anderson, who was awarded a Doctor of Science degree by the Massachusetts Institute of Technology, and who has had 35 years experience in industrial, government, and educational fields.

The department is undertaking industrial metallurgical research in foundry practice, process metallurgy, and physical metallurgy in addition to studies in metal economics.

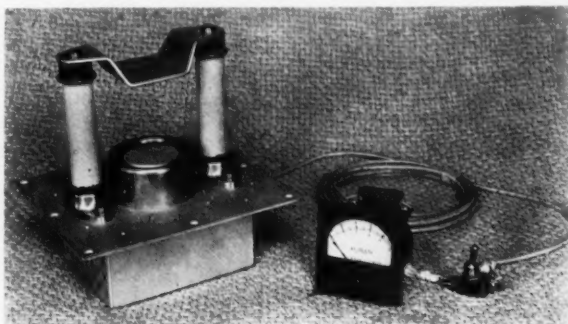
A nonprofit, independent research organization, Southwest Research Institute was established four years ago and is affiliated with the Institute of Inventive Research and the Southwest Foundation for Research and Education.

## Radio Frequency Voltmeter

A voltmeter that measures RMS values of radio frequency voltages in dielectric heating loads is available from Westinghouse Electric Corporation, E. Pittsburgh, Pa.

The use of this instrument will indicate to the operator of a dielectric heating apparatus the amount of heat that is being applied to the electrodes.

The voltmeter consists of a capacity voltage divider and a crystal rectifier unit, connected to an indicat-



ing instrument calibrated in kilovolts. No external power is required for operation other than that taken from the RF voltage source. This will be less than 0.1 watts.

Two scale ranges are used in measuring RMS values at voltages up to 10,000 volts: 0-5,000 volts and 0-10,000 volts. Frequency ratings are available in two styles of the instrument: 200 to 3,000 kilocycles and 3 to 50 megacycles.

\* \* \*

The Wakco slide rule will be of interest to those in any way involved in estimating metal weights in various sizes and shapes or the number of pieces that can be made from a large piece.

The rule is set up to calculate weight of Standard shapes of many metals, and also figures areas, volumes.

A lightweight magnesium alloy Slide Rule,  $12\frac{1}{4} \times 2 \times \frac{5}{32}$  inch, is marked with special scales and factors which allow weight and volume problems to be figured in a minimum number of operations. In addition to conventional polyphase and trig scales, the Rule has a thickness scale, a width scale, a length scale and scales supplying factors and information on material, shape and weight. Material scale markings are related to the density of lead, copper, brass, steel, cast iron, aluminum and magnesium, while the shape scale supplies the proper factors for  $\frac{1}{4}$ -round, fillet,  $\frac{1}{2}$ -round, ball, round, octagon, hexagon, rectangle or square.







LESTER A. SHEA, on leave of absence as General Sales Manager of Lindberg Engineering Company, 2450 W. Hubbard Street, Chicago 12, Illinois, has been selected Chief, Industrial Heating Equipment Section, Metalworking Equipment Division of the National Production Authority (N.P.A.), Washington, D. C. He brings a wealth of 27 years

of experience in the industrial heat treating and melting field to his new assignment as an industrial advisor to the government.

He is a member of American Society for Metals, American Foundry Society, Sales Executive Club of Chicago and American Institute for Management. He served 5 years on the Executive Board of the American Society for Metals, Chicago Chapter, two of which as its Secretary-Treasurer.

At Lindberg he is on the Executive Staff and Design Committee. He serves directly as coordinator for the various Lindberg Divisions, covering Heat Treating Furnaces, Fisher Melting Furnaces, Low Frequency Melting Furnaces, High Frequency Induction Equipment, Laboratory Furnaces, Air-Hydraulic Equipment, Transformers and Automotive Accessories. In addition he is engaged in all Advertising, Sales Promotion, Publicity and Government Requirements on Pricing and Renegotiation.

\* \* \*

#### Synthetic Clear Enamel For Chrome Plate Systems

A new synthetic clear enamel for use in the protection of chrome plate systems has just been announced by the Rhinshed-Mason Company, 5935 Milford Avenue, Detroit 10, Michigan and Anaheim, California.

Introduced under the trade-name Rust-Chek, the product is presently available in five separate formulas, designed for either high, medium or low baking schedules. Hand spray, electrostatic spray or dipping methods can be accommodated.

The line has been engineered to compensate for the lack of nickel available for civilian end products such as automotive chrome plate. When Rust-Chek is applied over "scant" chrome plating (minus the usual nickel coat), the plating is given long-term protection from rust and peeling.

\* \* \*

#### Sales Promotion Manager

H. W. Bluethe, formerly advertising manager of Wheelco Instruments Company, has joined the Lindberg Engineering Company, 2450 W. Hubbard Street, Chicago 12, Illinois, as sales promotion manager. He will be in charge of publicity, public relations and sales analysis.

#### New Furnace Loader

A new mechanical furnace loader, designed to speed up heat treating operations, has been developed by A. D. Alpine, Inc., of 11837 Teale Street, Culver City, California.

This loader speeds loading and unloading operations by eliminating single piece handling. All work to be treated is placed on the frame of the loader, which will handle several layers of work at one time, and the entire load picked up and inserted into the furnace by the fork bars of the loader.

Similarly, unloading is accomplished by simply inserting the fork bars and withdrawing the load from the furnace. The entire load is then wheeled to the quench tank or the next operation, and by hydraulic release quenched or placed at any desired level. The operator is protected from heat by a built-in metal shield.

Mounted on four swivel casters for easy, smooth rolling, the Loader offers around-the-plant usefulness as a hydraulic operated lift truck, carrying and lifting jigs, tools, dies, light work, etc.

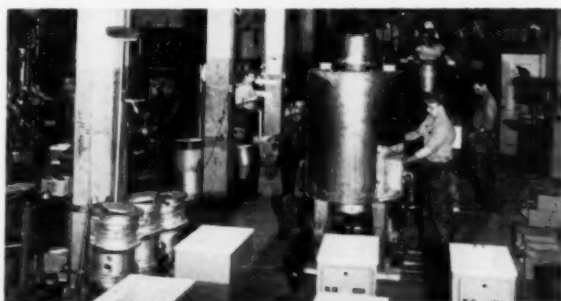
\* \* \*

#### New Lindberg Plant

Lindberg Engineering Company of Chicago, manufacturers of a wide variety of industrial products and heating equipment have just announced an increase of their manufacturing facilities.

With the opening of Lindberg Plant No. 2, additional 6200 square feet of production space are now available to energetically attack a backlog created by an unusually large acceptance of Lindberg equipment during the past six (6) months.

C. H. Stevenson, V.P., states that deliveries will



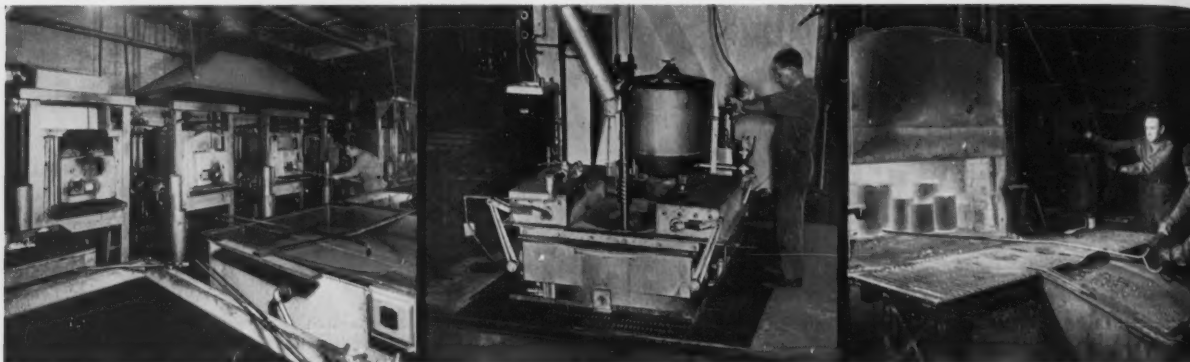
Partial view of one of the departments for small furnaces at Lindberg Plant No. 2.

improve even beyond the record shipments in April, where they reached an all time high.

Lindberg Plant No. 2 at 2317 Grand Avenue will manufacture laboratory furnaces, small induction heating units, Fisher type melting furnaces and atmosphere generators, thereby relieving the main plant to speed up production of large industrial heat treating furnaces.

# Only the Commercial Heat Treater Can Give You COMPLETE Service...

“Custom



**T**HE REASONS for the growth and national acceptance of the commercial heat treating industry are numerous, but fundamentally are based upon one important factor namely “Completeness Of Service” from A to Z—all under one roof.

Of equal importance is the fact that this very versatility automatically with time creates an equally wide variety of skills—skills in handling and processing all types of heat treating from simple stress relief to delicate controlled atmosphere hardening, cyaniding, etc.

In the true sense of the word your commercial heat treater is a “Specialist” with his entire organization established and built around “Service.”

The members of The Metal Treating Institute are the recognized leaders of the field and comply with the high quality standards established by such a group.

*If you are faced with heat treating problems or the need for heat treating services write*

## CALIFORNIA

California-Doran Heat Treating Co.  
2850 E. Washington Blvd., Los Angeles  
Cook Heat Treating Corp.  
5934 Alcoa Ave., Los Angeles 11  
Hollywood Heat Treating Co.  
1046 No. Orange Drive, Los Angeles 38  
Lindberg Steel Treating Co.  
3537 East 16th St., Los Angeles 23  
Dexter Metal Treating Co.  
1026—77th Ave., Oakland 21  
Industrial Steel Treating Co.  
600 Fallon St., Oakland 7

## COLORADO

Metal Treating & Research Co.  
651 Sherman St., Denver 3

## CONNECTICUT

Commercial Metal Treating, Inc.  
89 Island Brook Ave., Bridgeport 6  
Stanley P. Rockwell Co.  
296 Homestead Ave., Hartford 5

## ILLINOIS

Seneca Heat Treating Co.  
70 S. Batavia Ave., Batavia  
Accurate Steel Treating Co.  
2226 W. Hubbard St., Chicago 12  
Chicago Steel Treating Co.  
333 North California, Chicago  
Dura-Hard Steel Treating Co.  
2333 West Deming Place, Chicago 47  
Lindberg Steel Treating Co.  
222 North Laflin St., Chicago 7  
Pearson Industrial Steel Treating  
5757 Ogden Ave., Chicago 50  
Perfection Tool & Metal Heat Treating  
1740 West Hubbard St., Chicago 22  
Fred A. Snow Co.  
1942 West Kenzie St., Chicago 22  
American Steel Treating Co.  
P. O. Box A, Crystal Lake  
Eklund Metal Treating, Inc.  
721 Beacon St., Love Park

**METAL**

271

METAL TREATING

# to Tailored

## To Meet Your Specifications



For the BEST in Heat Treating Consult these Companies:

**R. T. Muehlemaier Heat Treating Co.**  
1531 Preston St., Rockford

### INDIANA

**Merl Heat Treat Corp.**  
1824 So. Franklin St., South Bend 23

### MARYLAND

**Maryland Tool Company**  
111-13 Hollingsworth St., Baltimore 2

### MASSACHUSETTS

**New England Metallurgical Corp.**  
9 Alger St., South Boston 27  
**Porter Forge & Furnace, Inc.**  
74 Foley St., Somerville 43  
**Greenman Steel Treating Co.**  
284 Grove St., Worcester 5

### MICHIGAN

**Anderson Steel Treating Co.**  
1337 Maple St., Detroit 7  
**Doworth Steel Treating Co.**  
18174 West Chicago Blvd., Detroit 28  
**Commercial Steel Treating Corp.**  
6100 Tireman Ave., Detroit 4  
**Commonwealth Industries, Inc.**  
5922 Commonwealth Ave., Detroit 8  
**Michigan Steel Processing Co.**  
3120 Denton, Detroit 11  
**Standard Steel Treating Co.**  
3468 Lovett Avenue, Detroit 10  
**Vincent Steel Process Co.**  
2424 Bellevue Ave., Detroit

### MINNESOTA

**Metallurgical Control Labs.**  
2226 East Lake St., Minneapolis 7

### MISSOURI

**Lindberg Steel Treating Co.**  
650 East Taylor Ave., St. Louis 15  
**Paulo Products Co.**  
5711 West Park Ave., St. Louis 10

### NEW JERSEY

**Ace Heat Treating Co.**  
611 Grove St., Elizabeth  
**American Metal Treatment Co.**  
Highway 25 and LaFayette St., Elizabeth  
**Benedict-Miller, Inc.**  
Marin Ave. and Orient Way, Lyndhurst  
**Bennett Steel Treating Co.**  
246 Raymond Boulevard, Newark 5  
**L-R Treating Co.**  
107 Vesey St., Newark

### NEW YORK

**Fred Heinzelman & Sons**  
138 Spring St., New York 12  
**Alfred Heller Heat Treating Co.**  
391 Pearl St., New York 7  
**Metro Heat Treat Corp.**  
466 Broome St., New York 13  
**Lindberg Steel Treating Co.**  
620 Buffalo Road, Rochester 11  
**Syracuse Heat Treating Corp.**  
1223 Burnet Ave., Syracuse 3

### OHIO

**Cincinnati Steel Treating Co.**  
Wooster Pike & Mariemont Ave., Cincinnati 27  
**Queen City Steel Treating Co.**  
2980 Spring Grove Ave., Cincinnati 25  
**Ferrotherm Co.**  
1861 E. 65th St., Cleveland 3  
**Lakeside Steel Improvement Co.**  
5418 Lakeside Ave., Cleveland 14  
**George H. Porter Steel Treating Co.**  
1265-71 East 55th St., Cleveland 14  
**Reliable Metallurgical Service, Inc.**  
3827 Lakeside Ave., Cleveland 14  
**Winton Heat Treating Co.**  
20003 West Lake Road, Cleveland 16  
**Dayton Forge & Heat Treating Co.**  
2323 East First St., Dayton 3  
**Ohio Heat Treating Co.**  
1100 East Third St., Dayton 2

### PENNSYLVANIA

**Robert Wooler**  
Limekiln Pike, Dresher  
**J. W. Rex Co.**  
834 West Third St., Lansdale  
**The Drever Company**  
220 West Cambria St., Philadelphia 33  
**Lorenz & Son**  
1351 N. Front St., Philadelphia 22  
**Metlab Company**  
1000 East Mermaid Lane, Philadelphia 18  
**Wiedemann Machine Co.**  
4272 Wissahickon Ave., Philadelphia 32  
**Ferrotherm Company**  
4911 Butler St., Pittsburgh  
**Pittsburgh Commercial Heat Treating Co.**  
49th St. and A.V.R.R., Pittsburgh 1

### TEXAS

**Cook Heat Treating Co., of Texas**  
6233 Navigation Boulevard, Houston 11

### WISCONSIN

**Wesley Heat Treating Co.**  
825 South 21st St., Manitowoc  
**Hushek Metal Processing Co.**  
1536 West Pierce St., Milwaukee  
**Metal Treating, Inc.**  
720 South 16th St., Milwaukee 4  
**Supreme Metal Treating Co.**  
4440 West Mitchell St., Milwaukee 14  
**Turner Heat Treating Co.**  
809 West National Ave., Milwaukee 4  
**Wesley Steel Treating Co.**  
1301-1403 West Pierce St., Milwaukee  
**Harris Metals Treating Co.**  
1745 Taylor Ave., Racine  
**Spindler Metal Processing Co.**  
2338 Mead St., Racine  
**Wesley Metal Treating Co.**  
2320 Mead St., Racine

# HEATING INSTITUTE

71 AVENUE • NEW ROCHELLE, N. Y.



or consult the MTI members listed above

# Heat Treating Abstracts

VOL

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## HARDENING FILES IN SALT BATHS

The advantages of hardening files and other ultra-hard parts in salt baths are well known, but one British heat treater discovered that when he hardened some files in certain types of molten salts the files came out with a case somewhat softer than the sub-surface metal. The problem was ultimately solved by using a new salt, known in England as Cassell F.H. 750. The heating compound is composed largely of alkaline earths (largely chlorides) plus some sodium cyanide. The material is carburizing to most carbon and low alloy steels, and will restore a decarburized case to a depth of 0.0005 in.

(Files and Tools, Advantages of Heat Treatment in Salt Baths, by D. Thomas, *Iron & Steel*, March 1952, p. 85-88.)

\* \* \*

## AUTOMATIC HARDENING OF STEEL CAMS

Three different sizes of automatic transmission cams for automobiles are hardened simultaneously on an automatic flame-hardening machine at the rate of 550 per hour. In each case, 6 to 8 internal lobes are hardened by an oxygen-propane flame.

The internal recesses of each cam ring must be hardened while leaving the adjacent areas soft. Hardness must be sufficient to withstand pressures of over-riding clutch rollers. Where holes are drilled at right angles to the cam face, high ductility is required to avoid cracking the surface.

Each heating unit of the Cincinnati Flamatic machine operates separately and is controlled electronically. Heat is controlled to within  $\pm 5^\circ\text{F}$ , and temperatures of the metal are raised as much as  $500^\circ\text{F}$  per second.

The operation was designed to handle cams made of SAE 1060 and SAE 4063, but other steels have been treated when substitutions have been necessary. The hardness pattern is closely held from piece to piece and there is little distortion in the parts. Hardness on the lobe is  $63\frac{1}{2}$  Rockwell C at 0.015 in. below the surface and 60 Rockwell C 0.080 below. Other than loading the machine and pushing a button to start the cycle, the entire operation is automatic even to unloading the parts and separating them after they leave the oil quench. Heating time is from 9 to 12 sec. for each piece and 3 or 4 sec. are required for loading.

(Flame Hardening Treats Cams at High Speeds, by W. G. Patton, *The Iron Age*, March 20, 1952, p. 98-99.)

\* \* \*

## TROUBLE IN STOP-OFF CASE HARDENING WITH COPPER PLATING

In England, as in the United States, copper plating is widely used as a stop-off in case hardening to preserve soft areas on the pieces being treated. Trouble

is frequently encountered when carburizing gases infiltrate the copper areas and produce a case where it is not wanted. However, a different type of trouble appeared in England, where on some alloy-steel aircraft gears it was discovered that areas immediately adjacent to the copper-plating were not being hardened.

The parts were being hardened by box carburizing at  $900^\circ\text{C}$  in a charcoal compound containing sodium, barium and calcium carbonates. Barium carbonate was the largest component.

Close examination showed that there was no evidence of carbon penetration in the areas where the trouble existed. In some cases, traces of copper were found in the centers of areas which remained unhardened. Investigators concluded that barriers were established to prevent gas reacting with the steel surfaces.

After many possible sources of trouble were investigated, it was discovered that those compounds containing barium sulphide as an impurity in the barium carbonate, even in minute quantities reproduced the same results.

It was noted that no similar trouble was encountered in using copper plated stop-offs when gas carburizing was employed. However, in the plant where the discovery was made, gas carburizing was not practical.

("Migration" of Copper Plating in Box Carburizing, by T. W. Ruffe, A.I.M., and P.M.H. Chawner, *Metal Treatment and Drop Forging*; June 1952, p. 245 to 250.)

## LESS MUSCLE, MORE MACHINE

Before the development of industrial equipment and machinery, the productivity of our factories depended 15 per cent on man's labor, 79 per cent on animals, and 6 per cent on machines, and we produced 27 cents worth of goods per hour.

By 1960, it is estimated, human muscle will be doing only about 3 per cent, animals only 1 per cent, while machine power will be doing 96 per cent of the work—and the combination will be turning out \$1.61 worth of goods an hour.

## EFFICIENCY!

After World War II, the Army tore down a \$16,000,000 camp in Alaska and shipped the lumber hundreds of miles to Seattle, Wash.

After the cargo reached Seattle, a representative of the Department of Interior heard about it. He was looking for lumber. So the Department of Interior acquired the cargo and promptly shipped it back to Alaska!

When the lumber finally reached the spot where the Interior needed it, it was less than 10 miles from the original Army camp!



### Insurance for Heat Treaters (cont.)

Frankly, I believe the coverage is ideal for your Association. This policy, previously unattainable, protects the members of the Institute, who subscribe to the Plan, against possible losses which could be exceedingly costly.

It should be clearly borne in mind by all Members that this insurance in no wise conflicts with any insurance you now have. It is definitely a new type of insurance. Policies under this Plan are available only to Members of the Institute.

The total gross receipts of the Members of the Institute are quite substantial. Therefore, if a sufficient number avail themselves of this insurance, a premium sufficient to justify revisions based on the actual experience would be developed.

Already several Members have availed themselves of the insurance, and we are in active communication with several others relative to their taking it. Losses likewise have developed on those policies written and have been promptly paid.

There is no red tape involved in availing yourselves of the Plan. All you need to do is to give us an estimate of your annual gross receipt and a deposit premium equivalent to 20% of the premium, predicated at the rate of 1%. Binder will promptly be given you pending the issuance of the policy. You confidentially report your gross receipts monthly and are billed at 1%. The entire deposit is credited to final monthly statement or carried over to renewal policies.

Again I thank you sincerely for having given me this opportunity to explain the contract.

Mr. Easterby has clearly presented, in condensed form, the principles of this new type of insurance, which after many years of effort, has been made available to members of MTI through Lloyd's of London. The active question and answer period, continuing for more than a hour after his presentation, brought out many interesting aspects of the problem. All apparently received satisfactory answers.

It is believed desirable to refer to "Insurance for Heat Treaters" rather than "Insured Heat Treating" as previously done. The latter term is subject to misunderstanding and misinterpretation, as was earlier pointed out by one of our members, Luke Miel, who has had the advantage of legal training!

This insurance is intended to protect the Member from the legitimate risks of his business, just as we all buy fire insurance to protect us against the rare, but serious hazard of a bad conflagration, or as a trucking company buys insurance to cover it against the accidents of its business, regardless of whether these may be due to the negligence of its drivers or to other accidental causes.

This insurance protects the customer in connection with legitimate claims against the member, by assuring adequate financial resources to settle any valid claim which, in some instances, might be beyond the

capacity of the heat treater to pay. At the same time it relieves the heat treater of burdens which he might consider out of proportion to his heat treating charges. It assures him of adequate legal protection in the event that disputed claims get into court. It leaves the Member free to settle on his own terms claims for which he may not be legally liable, but which he wishes to pay as a matter of good will.

It is important to bear in mind that this insurance, like any other insurance, covers legal liability only. The insurance company is not required to pay claims for which the heat treater, himself, is not responsible. It does not, for example, insure the success of a heat treating job which fails due to causes beyond the control of the heat treater and which are not due to his negligence, error, omission, or faulty workmanship. Such failures might result from choice of the wrong steel by the customer; incorrect information as to the character of the steel; failure to prepare the work properly for heat treatment, (such as neglect to remove surface bark); inadequate stress annealing in parts where deformation is a critical factor; defective material, including harmful segregation, seams, cracks, inclusions and the like; unsuitable design, and so forth.

It is obvious that careful analysis to distinguish between valid and invalid claims would be necessary and that educational work will have to be done on behalf of the insured Member as well as his customer. Such educational work will have the valuable result of reducing failures to a minimum and thereby reducing the loss factor to the customer and the cost of insurance to the Member.

The Member must always be on guard to use care, skill and judgment to avoid incurring needless risks.

Members are cautioned against the broadcasting of advertising announcements to the effect that "we are now insured", or we now have "insured heat treating", implying "send us any old thing and we will pay for everything". This, obviously, would encourage the customer to be careless in his selection of materials or the planning and preparation of a job requiring heat treating. It would involve the Member in many unjustified claims and would finally result either in the cancellation of all insurance, or raising premiums to a prohibitive price.

As this type of insurance is new and difficult, careful, intelligent cooperation between the Members, their customers, and the insurance underwriters will be needed over a considerable period of time, with the purpose of reducing risks to a minimum. It is a pioneering venture. We have gained considerable new territory. It is necessary to hold this territory and to enlarge and cultivate it.

By HORACE C. KNERR

### GOOD INVESTMENT

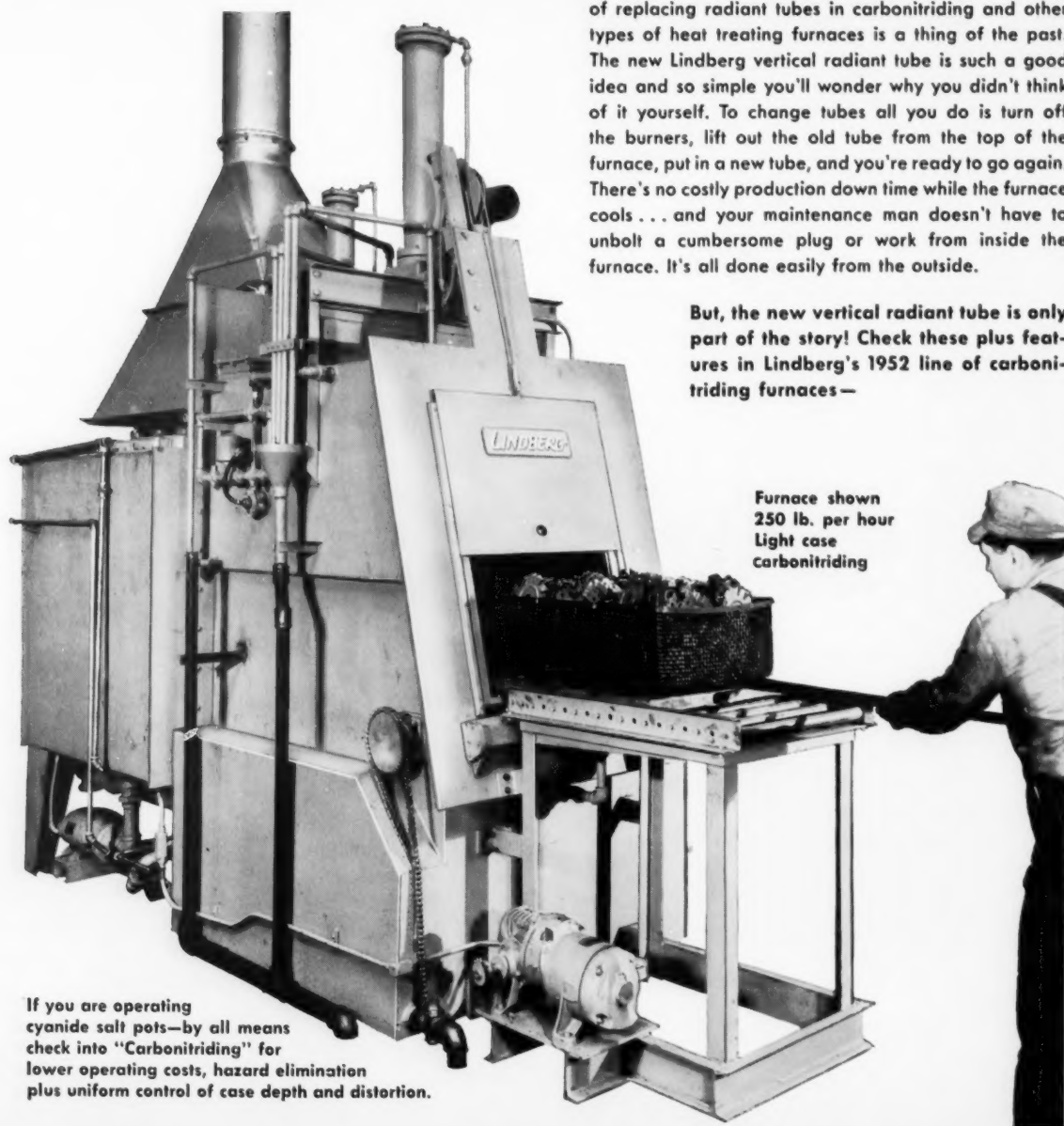
Using \$6.50 worth of scrap metal and his ingenuity, M. E. Brown, a mine foreman in Tennessee, invented a device for shifting heavy coal conveyor pans, thus making the miners' work safer and easier. The company handed him \$10,000.

# NEW

## THE VERTICAL *LINDBERG*

At last! The back-breaking, time-consuming, costly job of replacing radiant tubes in carbonitriding and other types of heat treating furnaces is a thing of the past. The new Lindberg vertical radiant tube is such a good idea and so simple you'll wonder why you didn't think of it yourself. To change tubes all you do is turn off the burners, lift out the old tube from the top of the furnace, put in a new tube, and you're ready to go again. There's no costly production down time while the furnace cools . . . and your maintenance man doesn't have to unbolt a cumbersome plug or work from inside the furnace. It's all done easily from the outside.

But, the new vertical radiant tube is only part of the story! Check these plus features in Lindberg's 1952 line of carbonitriding furnaces—



Furnace shown  
250 lb. per hour  
Light case  
carbonitriding

If you are operating cyanide salt pots—by all means check into "Carbonitriding" for lower operating costs, hazard elimination plus uniform control of case depth and distortion.

# RADIANT TUBE . . . NOW USED IN CARBONITRIDING FURNACES!

**A Package Unit . . .** With Lindberg Carbonitriding furnaces, you have no problem of buying and installing associated equipment. The furnace is engineered and built all in one package. It's complete . . . no extras.

**Built-In Quench System Minimizes Distortion . . .** Another important advantage is the built-in pitless quench tank. Undesirable distortion is avoided. The quenching is by means of vertically operated automatic elevator and takes place within the furnace structure. Heated charges are never exposed to the air . . . as would be the case if work had to be transferred from the heating chamber to a separate quench tank.

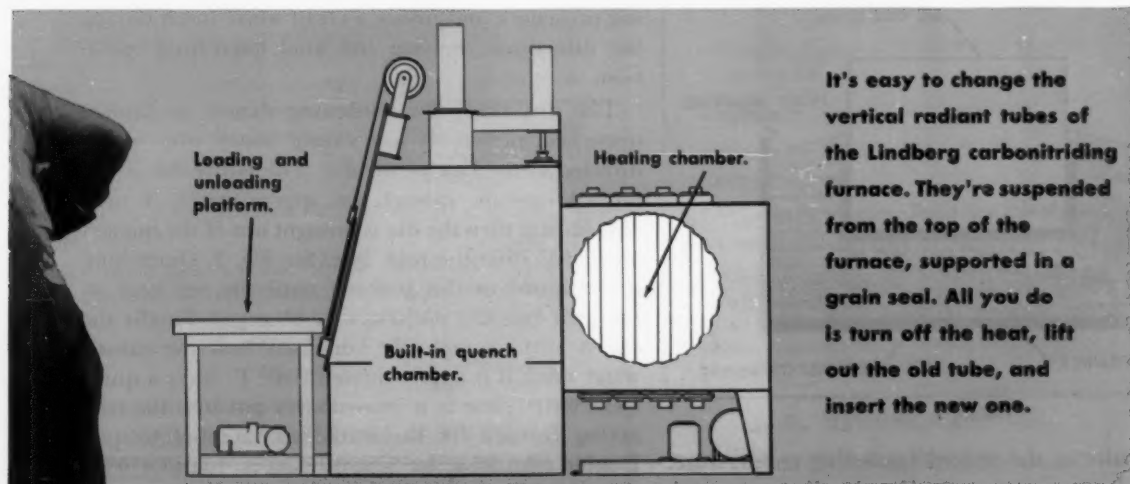
**Automatic Cycle Control . . .** Insures uniform case depth. At predetermined intervals, work is automatically removed from the heating chamber and quenched . . . thus uniform case depth is assured because each charge remains at heat the same length of time. The element of human error is eliminated.

**Four Furnaces in One . . .** The Lindberg "Hyen" Endothermic atmosphere generator is adjustable to produce different atmospheres not only for carbonitriding, but also for carburizing, annealing and bright hardening.

**Single Door Design Saves Floor Space . . .** Lindberg Carbonitriding

furnaces are loaded and unloaded from one end, through one and the same door. Less floor space is needed because operator loads and unloads from one location . . . not both ends of the furnace. Atmosphere contamination is thereby reduced. The single door design also reduces maintenance costs.

For the complete story of the Lindberg carbonitriding furnace, call your nearest Lindberg sales and service office or write Lindberg Engineering Company, 2466 West Hubbard Street, Chicago.



## **LINDBERG FURNACES**

Lindberg Engineering Company, 2466 West Hubbard St., Chicago 12, Ill.



# HEAT TREATING HINTS

## A SUCCESSFUL METHOD OF HEAT TREATING WATER HARDENING FORGING DIES

Tool steels have been heat-treated for a great many years yet everybody has his own special quenching procedure to obtain the desired results. In many instances they are quite successful but occasionally a die ruptures during the quenching process or else warps to a considerable extent.

It has often been the practice to blame the cause of rupture on poor tool steel or improper quenching. The latter undoubtedly is an important factor, poor tool steel is indeed a rare occurrence. The causes most often overlooked are poor preheating practice and uneven temperatures throughout the die. The hearth of a furnace is much hotter than the area three or four inches above the hearth floor. This is especially true of the older underfired type furnaces but even the most modern furnace might also function in the same manner. For this reason it is always best to place the work on a cast or welded tray at least  $\frac{3}{4}$ " to 1" thick. This helps prevent non-uniform temperature throughout the die and also assists in moving the work in and out of the furnace.

Dies of approximately 4" thick x 4" wide x 10" long must be preheated for several hours at 300° F brought to 800° F held several hours, heated to 1200°

The face of the die must be protected either by use of an atmosphere furnace or by placing the die face down in a container of new cast iron chips. Sticking of the chips to the die face can be prevented by placing a piece of wrapping paper between the die face and the cast iron chips. See Fig. 1.

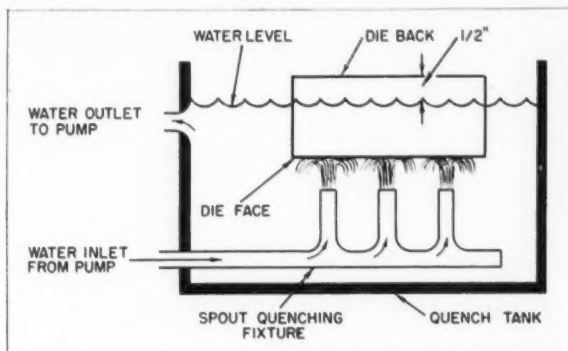


FIGURE 2

If a salt bath method of heating is preferred the dies may be preheated at 300° F and 800° F in a hot air recirculating tempering oven and then placed in the molten salt at 1200-1300° F. A 15 to 20% cyanide bath has been found very satisfactory. The salt will act as a protective coating during the normalizing procedure and insure a clean white finish during the subsequent heating and final quenching operation.

The die, ready for hardening should be flushed quenched, preferably in a caustic water, over spouts directed at the face of the die. The entire die is immersed into the quench for approximately 4 to 5 seconds and then the die is brought out of the quench about  $\frac{1}{2}$ " from the back face. See Fig. 2. Quenching is continued in this position until the red heat on the back face can no longer be observed. Finally the die is again completely immersed into the caustic water until it is approximately 150° F. After a quick fresh water rinse it is immediately put into the tempering furnace for the initial strain relief temper. Double tempering for 5 to 6 hours at 400 to 450° F will result in a hardness of 60 to 63 Rc generally acceptable for most forging operations.

FRED HEINZELMAN, SR.  
*Fred Heinzelman & Sons,*  
New York City.

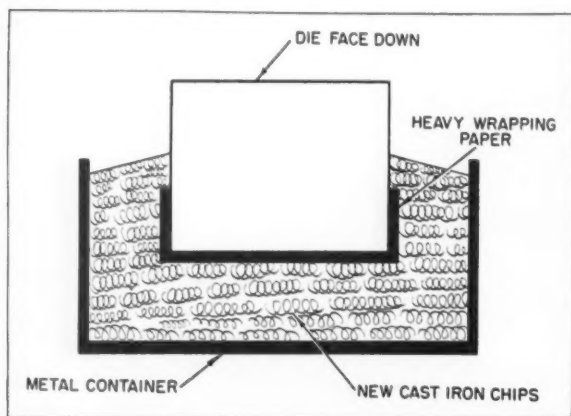


FIGURE 1

F and finally to the desired hardening temperature. It is good practice to normalize the die at approximately 1450° F before hardening. The preheating for normalizing should, however, be the same as for hardening with the exception that the times at preheating temperatures need not be for as long a duration.



## **Metallurgy of the Future (cont.)**

maintain the climate which has made all of this possible.

The need, therefore, is first, to maintain our system of free competitive enterprise, and this requires that we each take our share of responsibility in the field of politics.

Also, it is necessary to supply many more technically trained men than are being turned out by our educational institutions, if we are going to keep society abreast of the increased tempo of development. If we fail to do these two things, the future of metallurgy and the future of our nation do not offer a promising outlook.

The strength of the free world today depends upon one essential—military ability to maintain our independence. When the danger of military aggression is finally eliminated, and only then, can we return to giving our full attention to the ordinary affairs of life. The one hundred million small people in America are capable of doing a good job.

As to metal—steel always has been, and always will be the number one material. Aluminum is now number two. Copper, lead and zinc are very important and form group three. There are many other metals used in smaller quantities, such as nickel, chromium, tungsten, cobalt, molybdenum, columbium, titanium, which are indispensable. From the military standpoint, uranium 235 and plutonium are fundamental in the fissionable field.

Jet aircraft engines have created a new level of requirements for high temperature metals. They must be improved, both in quality and quantity. A metal so little known as germanium, has shown astonishing value in certain electronic fields. It is noteworthy that one part in one hundred million of impurity may interfere with its usefulness.

Industry, science and civilization often depend upon the leadership of a few individuals. For example, Bessemer and Siemens in steel, Hall in aluminum. The use of metals, in turn, depends upon inventions in other industries. For example, those of Bell, Edison, Ford, Kettering and the Wright brothers. All made great contributions to industry and created vast expanding markets for metals, as well as for employment.

We need have no fear of the future as to quality and quantity of our materials, provided we keep the political climate right. This is our business. We can, and must, attend to it.

REPORTED BY HORACE C. KNERR

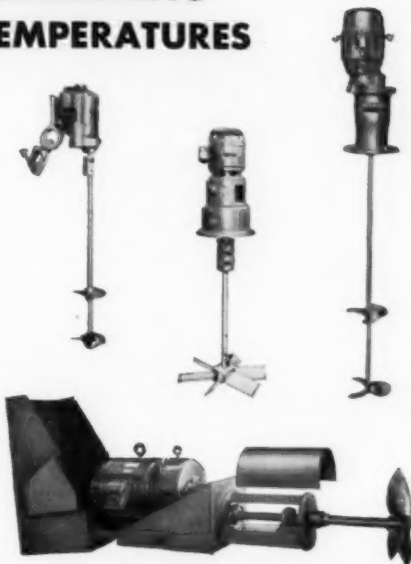
### **"FOOT-PRINTS ON SANDS OF TIME"**

In 1922 a soap manufacturer ordered that \$2 out of every \$3 of net profits thereafter made by his company was to go to charity, but stipulated that no public announcement be made of this fact for 30 years.

Recently the company made known that, in compliance with the manufacturer's will, more than \$30,000,000 has been donated to hospitals, colleges and other institutions.

# **DEVINE AGITATORS**

## **ASSURE UNIFORM QUENCHING TEMPERATURES**



- Provide proper circulation of quenching liquid.
- Help equalize quenching strains.
- Compact. Self-contained. No piping required.
- Unusually sturdy. Built for plenty of use.
- Easy to install. Easy to detach. Easy to maintain.

Devine Engineers will be glad to recommend a type and size to fit your tank.

**J. P. DEVINE MFG. CO.**

A. M. Cox, President

49th St. and AVRR • Pittsburgh 1, Pa.

# **Devine**

## **AGITATORS**



# Institute News...

At a recent meeting of the Executive Committee held in the MTI offices in New Rochelle the following committees were appointed:

## SPRING MEETING COMMITTEE

**Chairman**—Charles Wesley, Wesley Steel Treating Co., Milwaukee, Wisconsin  
Robert Weir, Commonwealth Industries, Inc., Detroit, Michigan  
Clifford Cook, Cook Heat Treating Co., of Texas, Houston, Texas

## NOMINATING COMMITTEE

**Chairman**—Al Cox, Pittsburgh Commercial Heat Treating Co., Pittsburgh, Pa.  
Fred Heinzelman, Jr., Fred Heinzelman & Sons, New York, New York  
Earl Brane, Nerl Heat Treat Corp., South Bend, Indiana  
Robert Sherwood, California-Doran Heat Treating Co., Los Angeles, Calif.

The Fall Meeting Committee announced that all arrangements have been completed with the Hotel Warwick in Philadelphia for the Annual Meeting of the MTI which will be held October 16, 17 and 18. It is not too early to make hotel reservations now. Special plans are being made for Sunday the 18th to include plant visitation and festivities at Horace Knerr's Metlab plant and at President Rex's farm.

\* \* \*

On Thursday June 19th, M.T.I. member, Benedict-Miller, Inc. formally opened its doors to its customers and friends to take its place among the industries which are making Lyndhurst their headquarters.

Benedict-Miller, Inc. has resulted from the merger, in 1949, of Benedict-Miller, Inc. warehousing of fine steels and the B-M Heat Treating Co. which specialized in metal treatment both of which were established in Newark, New Jersey in 1940. To a modest beginning in a building of about 10,000 square feet, which soon proved to be inadequate, two additions were made within a few years and then in 1945 another building of some 17,000 square feet was added.

In 1950 in order to promote efficiency and allow for further expansion Benedict-Miller, Inc. looked for a new home and finally, as a result of negotiations with the Lackawanna Railroad, purchased the Locomotive Repair Shop on Marin Avenue and Orient Way in Lyndhurst. Although considerable alterations were required, the building was adaptable to the business of the company and Benedict-Miller, Inc. now has over 100,000 square feet of working area under cover. It is one of the few steel warehouses in the United States with extensive heat treating facilities.

The officers of the company have been prominently identified with the distribution of steels in the metropolitan area for many years. Purdy Faitoute Benedict is President, Harvey L. Miller, Vice-President; George A. Pohle, Vice-President in charge of sales; Frederick C. Rimmele of Newark is Treasurer and

John P. Benedict is Secretary and in charge of plant operations. Prieth F. Benedict is Purchasing Agent and Dante P. Mariani, Credit Manager. Robert Bloss is in charge of Heat Treating operations with Horace Simonson as his assistant, and Fred Cairoli of Belleville is Warehouse Superintendent with Patrick Keenan as his assistant. Louis D'Alonzo is in charge of Telephone Sales and service on carbon bars and tool steels and Edward Graef heads up the telephone sales and service on stainless, structural alloys, and aircraft steels. Mr. Frank Mazzur is in charge of Technical Sales.

The company serves the area from the Canadian border to Philadelphia and has sales representatives covering this entire territory.

The heat treating shop is well equipped with various gas and electric furnaces for martempering, austempering, annealing, hardening, gas carburizing, induction hardening and normalizing as required.

These furnaces range from a few inches in dimension up to those having an opening of 54" x 60" and 12' deep. All furnaces can be controlled with close accuracy at temperatures up to 3000°F. The heat treating division handles a wide variety of items, from little springs that fit inside a fountain pen to molds and weldments weighing thousands of pounds apiece. Its services are used in civilian as well as military production. Shells, rolls, aircraft gears, cutting tools and dies are processed daily.



"---BUT BOSS, -YA TOLD ME TO PUT AN AGITATOR IN THAT QUENCH TANK!"

# New Development in Salt Baths

## Eliminates scale and decarburization on steels in neutral salt baths operating up to 2300° F.

**N**EUTRAL hardening in molten salt baths should mean just what it says. No scale or decarburization is present in a properly rectified neutral salt, regardless of temperatures used. This is possible at 1500°F. and up to 2300°F. A recent development by one of the leading salt bath suppliers makes this possible for the first time without the manual addition of solid deoxidizers. The Neutra-Gas Process (U. S. Patent No. 2474680) is simple, effective, and inexpensive. Merely bubble an inexpensive commercial gas through the molten bath for recommended periods. Neutrality is easily checked chemically or physically. The Neutra-Gas Process is operating at the present time in molten baths weighing less than 100 pounds and those holding several tons of salt.

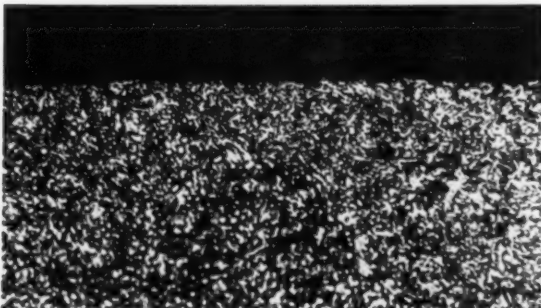
A truly neutral salt is the ideal medium for heating all steels with no surface effect. There is no atmosphere, and air is excluded while the work is heating. Scaling and decarburization are prevented. A thin film of salt protects parts right up to the quench. With neutral salts operating at 1500°-1600°F., Neutra-Gas is used for just a few minutes per shift. Sludging is practically eliminated; economies result because sludging removes good usable salt. The bath remains very fluid allowing rapid and uniform heating with less distortion. To obtain all the advantages of salt bath hardening, use salt baths for both heating and quenching. The improved fluidity of the Neutra-Gas controlled neutral salt assists materially in isothermal quenching salt operations.

### Neutral Salts from 850° - 1850°

Various salt mixtures provide a wide range of usefulness in the heat treatment of steel. The Neutra-Gas is used with chloride mixtures only. The most popular type is Park Nu-Sal Neutral Salt. Its melting point is 1230°F. with a range of 1300°-1600°F. Most steel hardening temperatures fall within this range. Nu-Sal is widely used as the austenizing bath for isothermal treatments such as austempering and martempering.

Cycle annealing involves a wider range of temperatures. Park K-3 Neutral Salt melts at 1020°F. and is usable past 1700°; periodic use up to 1850° is permitted if proper rectification is made with Neutra-Gas.

Low melting salts are available for special purposes. Park's #800 Neutral Salt (melting point 850°F.) and Park



(X 500) Microphotograph of the edge structure on SAE 1095 steel treated for 60 minutes at 1450°F. in a commercial installation of Park Nu-Sal kept neutral with the Neutra-Gas process. (Sample quenched in caustic solution and tempered in No. 800 Neutral Salt at 1200°F.)

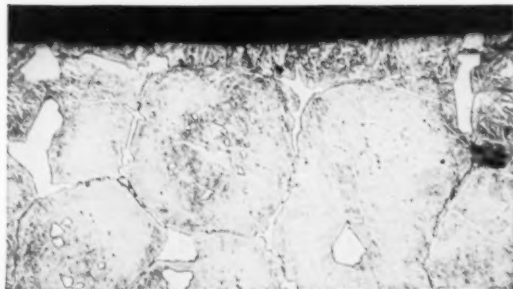
#900 Salt (melting point 920°) are used for tempering, high speed steel quenching, and have a range up to 1700°F.

Baths operating consistently at 1700° to 1900°F. usually operate with less fuming and volatilization if their melting points and top operating temperatures are slightly higher. Park K-17, with a range up to 1900°F., also has a reasonably low melting point of 1175°F. Economy is indicated here as the temperature of an idle furnace may be kept at 1250°-1300° with very low power costs.

### No Decarb on Moly High Speed Steels

Wider use of molybdenum high speed tool steels has virtually made the use of salt baths mandatory. During the last War it was salt baths which made possible the adoption of the molybdenum high speed steels in place of the very critical tungsten types.

As in most instances, the increased use of a method leads to rapid improvements. The improved rectification of high heat salt baths operating from 2200°-2300°F. is a development of the Park Chemical Company laboratories. The Neutra-Gas Process was adapted to the higher temperature applications in order to reduce the oxides of the chloride salts. Metallic oxides are reduced by graphite rods immersed in the salt. Costly and laborious sludging has been nearly



X500—(Reduced in Printing) Edge structure of high speed steel after several hours in a Park No. 175 Hi-Heat salt bath.

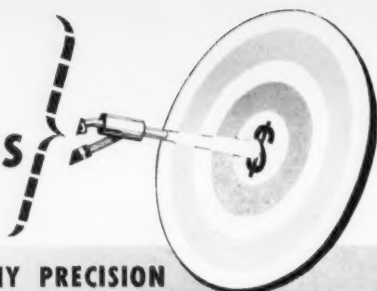
eliminated and electrode life increased. Size loss of tools is held to a minimum. It is possible to harden unground or finished tools. Scaling, decarb, oxidation, pitting and other surface defects are automatically avoided. Distortion is negligible. Immersion in salt seals out all atmosphere. Salt film protects work right through the quench. For pieces large or small, temperature is even and constant.

Process detail is preheat at 1550°F. in Park No. 117 Pre-heat Salt, high heat at 2200°-2350°F. in Park High Heat No. 175-S with Neutra-Gas. Quench in either No. 900 Neutral Salt, or in No. 100 Quench Salt which contains a small amount of cyanide. Tempering in salt completes the cycle, free from any deleterious effect caused by contact with the atmosphere.

Park's salt baths, and the knowledge of how to make them do a better job for you, can effect economies in your heat treat department. Write, telling us in detail your application, and we will send you the technical bulletin that covers your particular operation. There is a Park field engineer to assist you, backed by a technical staff and 40 years of Park Chemical Co. service to the heat treating industry. Park Chemical Company, 8076 Military Ave., Detroit 4, Michigan.

Write today for new 4-page bulletin on "Neutral Salt Baths and their operation" (Bulletin H-1)

a  
**Sure Shot  
for Savings**



## 14 REASONS WHY PRECISION FINISHING COSTS LESS WITH THE NEW LIQUAMATTE

Mechanical equipment for producing close tolerance finishes has finally been perfected. "Hand" finishes are now produced mechanically in a matter of seconds in the new Liquamatte without the operating difficulties usually encountered in these processes. A simplified method of wet blasting, the new Liquamatte has 14 advanced de-

sign features that lower finishing costs.

The Liquamatte is easier to start and more convenient to operate. Work can be handled faster with less effort and with far less down time. As a result, the Liquamatte uniformly removes scale and grinding lines at a new low cost. It cleans tools, dies and molds with greater efficiency while holding tolerances of .0001".

We believe the Liquamatte is the greatest advancement in close tolerance finishing in many years. We'd like the opportunity to prove it to you.



Typical heat treated forging die, one half of which has been cleaned with the Liquamatte using a fine mesh Liquabrasive.

THE 14 WAYS the Liquamatte simplifies wet blasting are described in Bulletin 23. Send for your copy today.



**American**  
WHEELABRATOR & EQUIPMENT CORP.  
855 S. Byrkit St., Mishawaka, Indiana

## It Really Happened

One of our good customers in the deep South wrote us—with true Southern friendliness and candor—about a certain heat treating job as follows. "Unless there is an appreciable saving we would prefer to have these pieces treated by your scalefree method. If this deal costs a lot more over the old black and dirty system, or if it is going to take more than two days longer, just cook this stuff in the good old fashioned way."

We are happy to report that he got them back clean, quick, and at "good old fashioned" prices.

Theodore Wiedemann, first commercial heat treater in the Philadelphia area and one of the earliest in the United States, understood the difficulties and exasperations which all heat treaters must bear. He used to illustrate this with the following saying—

"We heat treaters are not afraid to die.

If we go to Heaven we deserved it.

If we go to Hell we don't care, we are used to it."

\* \* \*

Those who continue to shrink from responsibility—continue to shrink.

\* \* \*

There is a close relationship between hard work, a light heart, and a clear mind.

# UPTON

offers

## THE MOST ADVANCED SALT BATH FURNACES FOR

BATCH  
TYPE  
WORK

CONVEYORIZED  
TYPE  
WORK

## WHY NOT GET THE BEST?

### UPTON ELECTRIC FURNACE COMPANY

16806 HAMILTON AVENUE, DETROIT, MICH.

ERNEST F. ELLIOTT — SALES MANAGER

PHONE DIAMOND 1-2520



## For Sale

### PIT TYPE ELECTRIC FURNACE

#### 1—MODEL M 737— SERIAL No. 536F

60 KW at 134 Line Voltage  
Max. Temperature 1175° F.

#### 1—MODEL M 780— SERIAL No. 584

60 KW at 220 Line Voltage,  
Max. Temperature 1175° F.

#### 1—MODEL M 692— SERIAL No. 505

45 KW Variable Heat Input  
Electric Furnace, Max. Temp.  
1200° F.

**SIZE:** All furnaces are the same size. Outside diameter of base 7'2".

These furnaces were made by Electric Furnace Company, Salem, Ohio, and are offered for immediate delivery. Controls are not available with these furnaces. For additional information contact

Fulton Sylphon Division

**ROBERTSHAW-FULTON  
CONTROLS COMPANY**

KNOXVILLE, TENN. • PHONE 4-1641

New products, which produce jobs in factories for making them, and jobs for those who sell and distribute them, don't just happen. Behind them are years and millions of dollars spent in research and development. For instance, 11 years and 27 million dollars were spent in research and development before nylon could be put on the market.

You can die for your country only once—but you can live for it daily.

The ladies buy 85 per cent of the 191,000,000 men's neckties sold in our land each year—or did you already know it?

Checking on its old grads, an Eastern university found that those with the largest waistbands were making the most money.

## LETTERS TO THE EDITOR

Dear Editor:

I read with interest your magazine, "Metal Treating", and find it packed full of pertinent and practical information for the heat treaters. I was wondering if it would be possible to have my name on your mailing list. I would be very appreciative of this courtesy.

H. F. FITZKEE  
Plant Engineer

The Wm. H. Ottemiller Co.  
York, Penna.

Dear Editor:

I would like to receive your Journal on Heat-treating. I received one copy and found some valuable information there for myself as well as for my men.

O. L. LORENTZSON  
Foreman Heat Treat Dept.

Saco Lowell Shops  
Biddeford, Maine

Dear Sir:

Please place my name on your mailing list for "Metal Treating." I obtained a copy from a fellow engineer and the information contained in the article on Magnaflex methods of nondestructive testing proved very valuable. Being a metallurgical engineer, I feel that your magazine will prove to be an asset.

MELVIN C. HOCKENBURY  
Project Engineer

Bldg. 172, Picatinny Arsenal  
Dover, New Jersey

Gentlemen:

We are on your mailing list and would appreciate it if you would send us one additional copy to the writer's attention, of your journal as we would like to pass this on to other interested parties.

H. H. WATJEN  
Manager Sales & Service

Lepel High Frequency Laboratories, Inc.  
Woodside, New York City, N. Y.

## Tempilstik®

*the amazing  
Crayons  
that tell  
temperatures*

A simple method of controlling working temperatures in:

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
- HEAT-TREATING IN GENERAL

It's this simple: Select the Tempilstik® for the working temperature you want. Mark your workpiece with it. When the Tempilstik® mark melts, the specified temperature has been reached.

**\$2**  
each  
gives up to 2000 readings

Available in these temperatures (°F)

113	263	400	950	1500
125	275	450	1000	1550
138	288	500	1050	1600
150	300	550	1100	1650
163	313	600	1150	1700
175	325	650	1200	1750
188	338	700	1250	1800
200	350	750	1300	1850
213	363	800	1350	1900
225	375	850	1400	1950
238	388	900	1450	2000

Also available in pellet or liquid form.

**FREE** —Tempil® "Basic Guide to Ferrous Metallurgy" — 16½" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

**METAL & THERMIT CORPORATION**

100 EAST 42nd STREET  
NEW YORK 17, N. Y.

# Manufacturers' Literature...

*The literature listed below contains information of interest to heat treating organizations. For your copy write direct to the manufacturer and be sure you mention seeing it reviewed in "Metal Treating."*

## BATCH PRODUCTION CASE HARDENING

Standard batch furnaces for case hardening steel are the subject of a new bulletin just released by Surface Combustion Corporation, Toledo 1, Ohio.

Controlled atmosphere equipment, including muffle furnaces and generators plus salt bath pot furnaces and direct-fired oven furnaces, are shown and described with typical applications to gas carburizing, liquid carburizing and cyaniding and pack carburizing.

\* \* \*

## AIRBLAST CABINETS

A new catalog 31-A showing the company's line of airblast cabinets in various sizes to serve a range of applications has been published by American Wheelabrator & Equipment Corporation, 1175 S. Byrkit Street, Mishawaka, Indiana. These cabinets are small unit-type machines which are suited for cleaning small lots of work that can be manipulated by hand and the production of which is not large enough to justify more extensive cleaning facilities. The units are available in both suction-type and pressure-type models, and one of the suction-type models can be used where limited space dictates a bench mounting.

\* \* \*

## TEMPILSTIK INSTRUCTIONS

The usefulness of Tempilstiks<sup>®</sup> under special environmental conditions is discussed and a number of ingenious procedures and techniques for determining temperatures in unusual applications are described in a new instruction sheet issued by Tempil<sup>®</sup> Corp., New York, N. Y. A few of the topics covered are:

- Attained temperatures of rapidly moving pieces and rotating objects.
- Temperature distribution and isothermal boundaries of a heated workpiece.
- Temperature indication against a brightly radiating background.
- Effect of strongly reducing atmospheres.
- Effect of ionized air and electrical fields.

\* \* \*

## G. E. OFFERS CONTROL SELECTION BULLETIN

A new eight-page selection guide for a wide range of electric and electronic controls, devices, and accessories has been announced as available from the General Electric Company, Schenectady 5, N. Y.

Designated as GEA-5781, the bulletin contains quick-reference selection data, photographs, and listings of additional publications which give complete information on each of the equipments.

Products included are: manual, magnetic, combination, and reversing motor starters; pushbutton stations; relays; limit switches; solenoids; photoelectric relay; electronic timer; electronic relay; pressure and vacuum switch; float switch; pressure governor; reduced-voltage starter; Thy-mo-trol<sup>®</sup> drive; and smoke density indicator and control.

\* Reg. Trade-Mark of the General Electric Co.

## TWO CHAMBER FURNACES

Lindberg-Fisher two-chamber industrial melting furnaces are described in a new 8-page bulletin.

The operation of stationary and tilting type two-chamber melting furnaces is explained and illustrated. A rating capacity-dimension table and a listing of typical applications are included.

\* Request Bulletin No. 560 from Lindberg Engineering Company, 2450 West Hubbard Street, Chicago 12, Illinois.

\* \* \*

## PAINT-ANCHORING PHOSPHATE TREATMENT FOR METALS

A new 8-page booklet describing ANCHORITE 100, a paint-anchoring corrosion-resistant phosphate treatment for metals, has just been published by Octagon Process, Inc., 15 Bank Street, Staten Island 1, New York. Printed in two colors, the booklet describes in detail the common causes of paint failure and how they can be prevented. It then goes into methods of application—immersion and spraying—of the ANCHORITE 100 treatment.

A separate discussion of typical products to which the ANCHORITE 100 process can be applied is well illustrated, and includes a number of defense items. The booklet points out that ANCHORITE 100 is one of the few pre-painting treatments that meets the specifications for Class C (Type II) finish in U. S. Army Specification No. 57-0-2C, as well as JAN-C-490, Grade 1.

\* \* \*

## THERMOCOUPLE ASSEMBLIES AND COMPONENTS

To present its complete line of standard thermocouple assemblies and parts, Leeds & Northrup Company has just published a newly-revised and illustrated 44-page catalog, Catalog EN-S2—"Thermocouples—Assemblies, Parts and Accessories"—which not only offers the latest information on available couples and couple assemblies for general applications, but also includes an expanded section on special couples for plant and laboratory.

In a simplified tabular arrangement, the publication lists the accuracy limits of couples, the temperature and physical limitations of thermocouple and protecting tube materials, and the recommended protecting tube and well materials for general applications. The expanded section on special couples includes those for such applications as open-hearth, glass feeder, pickling acid, steam plant, and blast furnace installations. Component parts of couple assemblies—heads, tubes, elements, insulators, etc.—are fully described and illustrated. The catalog itself has a handy margin-index to facilitate finding specific sections.

# BETTER

for all steels...

# BEST

for lean alloys...

# Houghto-Quench



**\*HOUGHTO-QUENCH gives  
you all 3 essentials  
to every quench!**

You'll meet your most critical quenching needs with Houghto-Quench. This is the stable oil developed by Houghton to give you these three essentials needed in heat treating low alloy steels:

1. **A Faster Quench** through the critical zone.
2. **Full Hardness** meets high physicals safely.
3. **Uniform Quenching** regardless of type of steel used or temperature required.

Ask the Houghton Man to show you why Houghto-Quench is more than ever the oil to specify today. Or write to E. F. Houghton & Co., Philadelphia 33, Pa., for prompt information and prices.

ONE SOURCE FOR ALL NEEDS  
OF METALWORKING



Get "Liquid Salt Baths"—Houghton's latest booklet covering heat treating salts for carburizing, neutral hardening, annealing, tempering, martempering and other heat treating operations. Write to E. F. Houghton & Co., Philadelphia 33, Pa., or ask the Houghton Man.

HOUGHTO-QUENCH

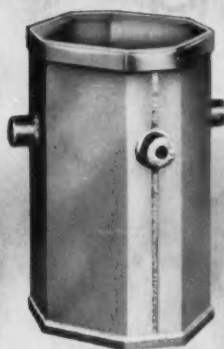
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**E. F. HOUGHTON & CO.**  
PHILADELPHIA • CHICAGO • DETROIT • SAN FRANCISCO

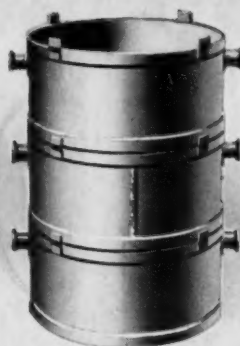


Ready to give you  
on-the-job service...

The original PSC carburizing box, now the most widely used in industry.

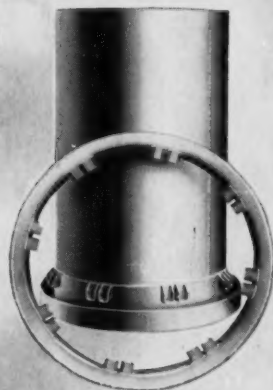


An example of the many special-purpose boxes we design and fabricate.

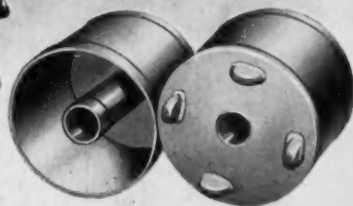


Special PSC retorts for small lots of different parts in gas furnaces.

Welded alloy retort for gas carburizing furnaces. Serving 10,000 hours.



PSC boxes that are light weight for easy handling, yet will not warp. In any size.



Chimney type boxes for carburizing ring gears, in any size.

**PSC furnishes**  
**CARBURIZING**  
**CARRIERS** *for*  
**Every Product**

As suppliers of the widest line of standard carburizing boxes, PSC can promptly furnish a standard type box for carburizing, for instance, ring gears of any size. But we also offer a wealth of experience in making special fixtures that will carry unusually shaped parts through carburizing and quenching to finishing, with only one handling.

PSC welded alloy carburizing boxes are used today by 80% of the nation's heat treaters. Weighing  $\frac{2}{3}$  less than cast equipment, they save handling as well as heat-up time. For instance, a study by a recent

*Light Weight of PSC Carburizing and Annealing Equipment Cuts Heat-Hour Costs*

customer showed that PSC light-weight equipment cut their cycle a total of 5 hours. Lasts longer too.

*Light-Weight Heat-Treating Equipment for Every Purpose*

Carburizing and Annealing Boxes  
Baskets • Trays • Fixtures  
Muffles • Retorts • Racks  
Annealing Covers and Tubes  
Pickling Equipment

Tumbling Barrels • Tanks  
Cyanide and Lead Pots  
Thermocouple Protection Tubes  
Radiant Furnace Tubes and Parts  
Heat, Corrosion Resistant Tubing

PSC heat-treating units are furnished in any size, design or metal specification. Send blue prints or write as to your needs.



**THE PRESSED STEEL COMPANY**

61 WILKES-BARRE, PENNSYLVANIA

Industrial Equipment of Heat and Corrosion Resistant WEIGHT-**SAVING** Sheet Alloys

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